ANTARCTIC SCOPELARCHIDAE: A NEW FISH OF THE GENUS *BENTHALBELLA* AND THE DISTRIBUTION OF *B. ELONGATA* (NORMAN)

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The new Antarctic species described here was collected by members of the Department of Biological Sciences and Allan Hancock Foundation of the University of Southern California aboard the USNS *Eltanin* while engaged in an ecologic study of the marine biota of the Antarctic Seas. The study is supported by the United States Antarctic Research Program of the National Science Foundation (G-19497). The type series is represented by 30 *Eltanin* specimens (67.7-221 mm. standard length) and one specimen from the southwestern Pacific that was kindly loaned by Richard H. Rosenblatt of the Scripps Institution of Oceanography. All specimens were taken by 10-foot Isaacs-Kidd midwater trawls.

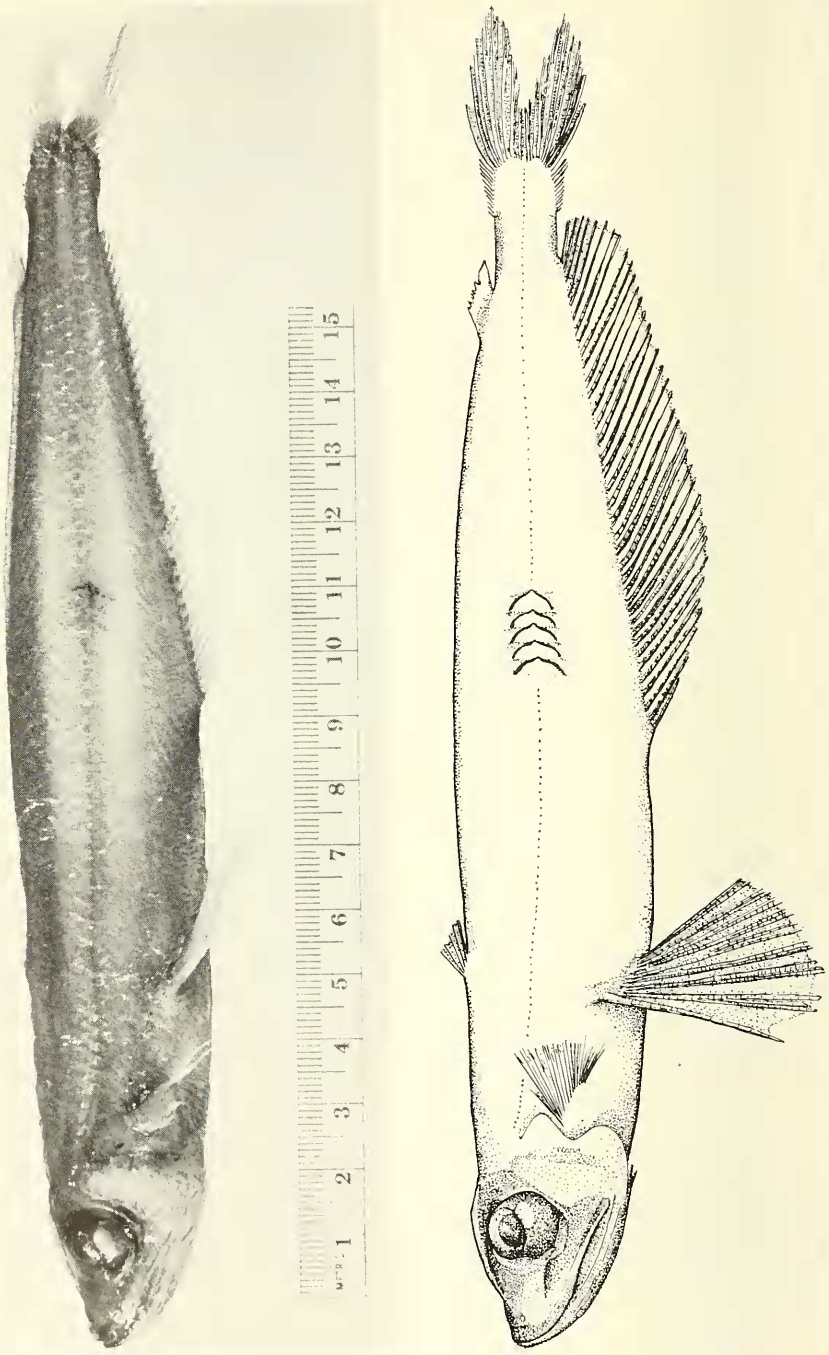
The new *Benthalbella* resembles its congeners in the forward position of the ventral fins (in advance of the dorsal origin), the elongate body and the high vertebral count (60-63).

Specimens have been deposited at the Los Angeles County Museum (LACM), Scripps Institution of Oceanography (SIO), U.S. National Museum (USNM) and the British Museum of Natural History (BMNH).

We wish to thank all persons responsible for making the collections and Robert J. Lavenberg, John R. Paxton and Jay M. Savage for critical reviews of the manuscript.

Benthalbella macropinna, new species
Figure 1

Holotype. LACM 10118; 209 mm. standard length (SL); *Eltanin* station (Elt. Sta.) 359, Scotia Sea, 56°17′S, 58°09′W; 6-7 December 1962. Collected by an Isaacs-Kidd 10-foot midwater trawl towed between the surface and 840 meters over a bottom of 3960-3990 meters.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Paratypes. LACM 10119; 1, 117 mm. SL; Elt. Sta. 141, 60°19′S, 65°08′W. LACM 10120; 1, 118 mm. SL; Elt. Sta. 143, 60°05′S, 65°11′W. LACM 10121; 1, 114 mm. SL; Elt. Sta. 148, 59°10′S, 65°04′W. LACM 10122; 1, 175 mm. SL; Elt. Sta. 285, 65°58′S, 70°35′W. LACM 10123; 1, 163 mm. SL; Elt. Sta. 396, 59°02′S, 56°05′W. LACM 10124; 1, 126 mm. SL; Elt. Sta. 397, 59°11′S, 56°12′W. LACM 10125; 1, 221 mm. SL; Elt. Sta. 563, 48°13′S, 20°26′W. LACM 10126; 1, 192 mm. SL; Elt. Sta. 738, 53°06′S, 37°43′W. LACM 10127; 1, 108 mm. SL; Elt. Sta. 802, 66°08′S, 82°32′W. LACM 10128; 1, 94 mm. SL; Elt. Sta. 836, 61°52′S, 75°14′W. LACM 10129; 1, 138 mm. SL; Elt. Sta. 839, 61°05′S, 74°59′W. LACM 10130; 1, 140 mm. SL; Elt. Sta. 854, 63°57′S, 79°25′W. LACM 10131; 1, 218 mm. SL; Elt. Sta. 866, 59°45′S, 78°35′W. LACM 10132; 1, 94 mm. SL; Elt. Sta. 882, 55°10′S, 114°15′W. LACM 10133; 1, 125 mm. SL; Elt. Sta. 890, 59°45′S, 114°50′W. LACM 10134; 1, 156 mm. SL; Elt. Sta. 900, 62°03′S, 115°07′W. LACM 10135; 1, 179 mm. SL; Elt. Sta. 949, 65°47′S, 88°48′W. LACM 10136; 1, 137 mm. SL; Elt. Sta. 952, 63°39′S, 86°54′W. LACM 10137; 1, 190 mm. SL; Elt. Sta. 1099, 57°00′S, 89°09′W. LACM 10138; 1, 132 mm. SL; Elt. Sta. 1121, 62°14′S, 89°55′W. LACM 10139; 1, 111 mm. SL; Elt. Sta. 1162, 59°35′S, 130°25′W. LACM 10140; 1, 140 mm. SL; Elt. Sta. 1163, 60°02′S, 130°32′W. LACM 10141; 1, 90 mm. SL; Elt. Sta. 1204, 55°57′S, 159°22′W. LACM 10142; 1, 150 mm. SL; Elt. Sta. 1324, 58°37′S, 108°50′W. LACM 10143, 1, 155 mm. SL; Elt. Sta. 1342, 56°12′S, 120°07′W. LACM 10144; 1, 125 mm. SL; Elt. Sta. 1358, 57°44′S, 137°51′W. SIO 61-42-25A; 1, 188 mm. SL; 57°55.8′S, 168°53.2′E. USNM 260173-F1; 1, 207 mm. SL; Elt. Sta. 396. USNM 260173-F2; 1, 135 mm. SL; Elt. Sta. 1162. BMNH 1965.5.26.4; 1, 198 mm. SL; Elt. Sta. 143.

Diagnosis. Benthalbella macropinna is distinguished from all other species of *Benthalbella* by its high anal ray count, 35-37 (17-30 in other species); low dorsal ray count, 5-6 (6-10 in other species) and anterior insertion of the dorsal fin, predorsal length 27.8-32.8 per cent of SL (ca. 38-43 per cent of SL in other species).

Description. Body elongate; dorsal margin posterior to head nearly straight; ventral margin tapering gradually from head to deepest point of body (at anal origin); anal fin base extending in straight

line to caudal peduncle. Head and body compressed, greatest width between opercles, body tapering to tail. Head profile convex over eyes, curving upward at tip of snout; inter-orbital space very narrow. Wide notch on opercular border conforming to pectoral fin base. Paired nostrils close behind tip of snout; anterior and posterior nasal openings separated by narrow membrane. Posterior border of maxillary reaching a vertical through posterior edge of orbit (maxillary slightly shorter in juveniles). Both jaws curving abruptly upward at snout, lower extending beyond upper jaw. Lateral line sloping from upper edge of gill opening to about midway between ventral base and dorsal margin and following a straight line to caudal base. Gillrakers absent. Pseudobranch present.

Proportions for the holotype and ranges for 12 paratypes are presented in Table 1. Counts for the holotype are followed by those for the paratypes in parentheses: D. 5 (5-6); A. 37 (35-37); P. 26 (25-27); V. 9 (9); C. 19 (19). Last dorsal, anal and ventral rays divided to base and counted as one. Dorsal fin rays weak, inconspicuous, originating behind origin of ventral fins. Anal fin base and rays very long; second or third ray longest (9 per cent of SL). Pectoral rays just reaching ventral origin; upper edge of base on a level with lower margin of orbit. Ventral fin rays strong, reaching three-fourths distance to anus; wide ventral base originating midway between lateral line and ventral margin. Posterior end of adipose base lying above terminal fourth or fifth anal ray; origin of adipose fin indistinct, continuous with a fatty ridge extending nearly to point above anus. A similar fatty ridge on ventral midline between anus and ventral fin bases. Caudal fin forked, principal rays preceded by 14-15 dorsal and ventral procurrent rays.

Tooth counts based on ten adult specimens: premaxillary 60-76; dentary, inner row 10-12, outer row 39-45; palatine, medial row 11-15, lateral row 2-4; lingual 13-16. Premaxillary teeth and outer row of dentary teeth small, close-set, slanting slightly toward rear of jaw. Inner row of dentary teeth, medial row of palatine teeth and lingual teeth long, dagger-like and sagittate. Smallest specimens have similar counts.

Body, nape and cheek covered with moderate-sized deciduous scales. Lateral line scales cycloid (only ones remaining on present specimens), enlarged, with one or two extending onto middle caudal rays. Each lateral line scale three dimensional, anterior border inferior and covered by raised posterior border of preceding scale; center of each scale pierced by a large lateral line pore to form a

large lateral line canal, lined by anterior border of each scale and covered by posterior scale borders.

Eye lenses directed upward. White pearl-colored organ on black ventral half of eye. Horizontal length of organ one half (juveniles) to two-thirds (adults) of lens diameter. Vertical length of organ one third (juveniles) to one half (adults) of lens diameter. Upper margin of pearl-colored organ bordered by a band of superficial melanophores, varying from an intense band in small specimens to a diffuse band of fine dots in adults.

Precaudal vertebrae 13-14, caudal vertebrae 46-50, total vertebrae 60-63 (defined according to Hubbs and Lagler, 1958). If the first caudal vertebra is considered to be the one that corresponds to the interhaemal of the first anal ray, then the formula is 24-25 precaudal, 36-38 caudal vertebrae.

Esophagus short; posterior caecum of stomach very long, extending nearly to anal opening; pyloric region very short and constricted; two long pyloric caeca present; intestine a straight tube nearly the length of the body cavity. Stomach and intestine unpigmented, peritoneum black.

Specimens containing large (mature?) ovaries were collected throughout the year and may indicate a long or continual breeding period. Distinct ovaries were present in 27 individuals. Gonads were not detected on the three smallest specimens (90-94 mm. SL) and the Scripps specimen was not dissected. A histological examination of the gonads of two mature specimens revealed no trace of testicular tissue.

Small specimens (up to 110 mm. SL) are nearly colorless. The body wall is transparent and the black peritoneum gives a dark appearance to the ventral half of the trunk. The thin muscular layer over the body wall contrasts strikingly with the much denser dorsal musculature and the muscles associated with the ventral fins. Larger specimens are light brown, evenly covered with small melanophores. The caudal and anal fin membranes are lightly pigmented, but the other fins are colorless. Freshly preserved material has a silvery sheen over the entire body.

Distribution. The distributions of *B. macropinna* and the only other known Antarctic scopelarchid, *B. elongata* (Norman), are shown in Figure 2.

Benthalbella macropinna occurs in Antarctic waters between 48°13′ and 66°08′S. Its distribution is generally south of the Ant-

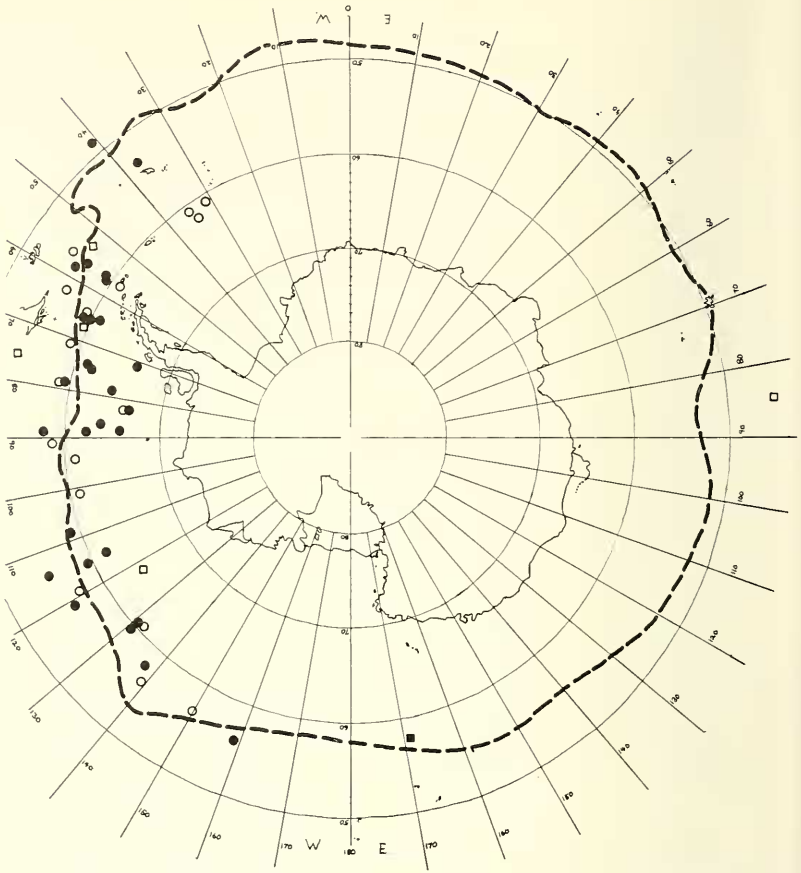

Figure 2. Distribution of *B. macropinna* (solid symbols) and *B. elongata* (open symbols). Circles represent *Eltanin* material; squares represent other records (Marshall, 1955; Andriashev, 1960). Antarctic Convergence shown as a dashed line.

arctic Convergence, but the species has been taken somewhat to the north of the Convergence as delimited by Deacon (1937). A circumpolar distribution is indicated because specimens have been taken between 37°43′W. and 168°53′E.

Benthalbella elongata has a distribution similar to the new species and was collected with it in the same haul on four occasions (Elt. Sta. 148, 802, 866 and 1163). *Eltanin* collections of *B. elongata* were made between 54°95′ and 61°31′S and between 31°04′ and

149°57′W. Other records, including one off South Africa, are summarized by Andriashev (1960).

Specimens of *B. macropinna* were collected in hauls reaching 610 to 2750 meters. *B. elongata* was taken between the surface and 2930 meters. No relationship between size of fish and depth of haul is apparent.

Discussion. Marshall (1955) considered the generic name *Benthalbella* Zugmayer (1911) unavailable because the generotype, *B. infans*, was a *species inquirenda* at the time of publication. He adopted *Neoscopelarchoides* Chapman (1939) (generotype *N. dentatus*) as the next available name. A *species inquirenda* is a doubtfully identified species. Zugmayer, in describing *B. infans*, indicated his belief that it was clearly a new genus and species regardless of the fact that it was a post-larva and that he was uncertain of its familial position. *Benthalbella* satisfies all the requirements for availability listed in chapter four of the International Code of Zoological Nomenclature (1964). In accord with the Law of Priority (Art. 23), *Benthalbella* (generotype *B. infans*), the oldest available name, must stand.

On the basis of superficial characters, *B. macropinna* resembles those species with high anal ray and vertebral counts: *B. elongata*, *B. linguidens* (Mead and Böhlke) and *B. diaphana* Rass. No close alliance between any of these forms and the new species is apparent however.

Of the known species of *Benthalbella*, *B. elongata* is the only species in which the adults retain a colorless peritoneum. All other members of this genus have unpigmented alimentary tracts, but black peritoneum in adults. McAllister (1959) advanced the hypothesis that the intense pigmentation of the digestive tract and/or the peritoneum favors predators by absorbing light emitted from engulfed luminous prey. His idea that this luminescent food would reveal the fish's position to a predator may be questioned because lanternfish (Myctophidae) were found in the stomachs of both unpigmented *B. elongata* and pigmented *B. macropinna*.

No male specimens of *B. macropinna* nor *B. elongata* were found, although 27 females of the former and 15 females of the latter species were examined. Cross-sections of the gonads from two specimens of each species reveal normal cystoarian ovaries with no associated testicular tissue. Therefore, the lack of male specimens prob-

ably should be attributed to other phenomena than hermaphroditism. It is possible that males are very rare or are not collected by the present collecting gear because of their small size, great velocity or somewhat different habitat.

TABLE 1

Body proportions for the holotype and ranges for 12 paratypes of *B. macropinna*, expressed as per cent of standard length.

	Paratypes		Holotype
	5 specimens	7 specimens	LACM 10118
Standard length (mm.)	67.7-140	163-221	209
Head length	20.2-22.6	17.7-21.6	19.0
Head depth	12.2-13.8	12.5-13.7	12.5
Snout length	5.1- 6.0	4.5- 5.5	4.9
Orbit diameter	7.9-10.7	5.9- 8.7	6.9
Interorbital distance	0.9- 1.3	0.9- 1.2	1.1
Postorbital distance	9.2-11.0	8.6-10.9	9.3
Upper jaw length	14.2-15.8	13.7-14.6	13.8
Mandible length	16.4-18.0	16.0-16.9	15.8
Body depth at ventral fin origin	10.9-16.3	14.1-16.7	15.2
Body depth at anal fin origin	12.9-14.7	14.6-19.0	16.8
Depth of caudal peduncle	3.5- 5.2	4.8- 5.6	4.8
Predorsal length	29.8-32.8	27.9-31.3	29.7
Preanal length	50.0-52.3	51.0-54.7	52.6
Prepectoral length	19.5-21.8	16.3-19.5	19.0
Preventral length	29.0-31.6	25.9-30.6	29.9
Distance from dorsal origin to caudal base	68.0-72.1	68.5-73.0	71.3
Distance from anal origin to caudal base	47.4-49.6	48.1-51.7	53.5
Pectoral fin length	9.6-13.0	7.7-10.0	7.7
Ventral fin length	16.7-20.2	16.7-18.1	17.8

Literature Cited

ANDRIASHEV, A. P.

1960. New families of fishes for the Antarctic. Report No. 2. Pearleye family (Pisces, Scopelarchidae). *Akademiya Nauk SSSR, Zoologicheskii Zhurnal*, 39(4):563-566.

CHAPMAN, W. M.

1939. Eleven new species and three new genera of oceanic fishes collected by the International Fisheries Commission from the northeastern Pacific. *Proc. U.S. Natl. Mus.*, 86:501-542.

DEACON, G. E. R.

1937. The hydrology of the Southern Ocean. *Discovery Rept.*, 15:1-124.

HUBBS, C. L., and K. F. LAGLER

1958. Fishes of the Great Lakes region. *Bull. Cranbrook Inst. Sci.*, 26:1-213.

INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE

1964. *International code of zoological nomenclature*. Suffolk, England: R. Clay and Co., 176 p.

McALLISTER, D. E.

1959. A collection of oceanic fishes from off British Columbia with a discussion of the evolution of black peritoneum. *Bull. Natl. Mus. Can. Zool.*, 172:39-43.

MARSHALL, N. B.

1955. Alepisauroid fishes. *Discovery Rept.*, 27:303-336.

ZUGMAYER, E.

1911. Poissons provenant des campagnes du Yacht 'Princesse-Alice' (1901-1910). *Résultats des campagnes scientifiques . . . Monaco . . .*, 34:1-174.

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